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Examiners' report

MATHEMATICS A

H230

For first teach in 2017

H230/01 Autumn 2020 series

Version 1

ocr.org.uk/maths

Introduction

Our examiners' reports are produced to offer constructive feedback on candidates' performance in the examinations. They provide useful guidance for future candidates.

	Reports for the Autumn 2020 series will provide a broad commentary about candidate performance, with the aim for them to be useful future teaching tools. As an exception for this series they will not contain any questions from the question paper nor examples of candidate answers.

The reports will include a general commentary on candidates' performance, identify technical aspects examined in the questions and highlight good performance and where performance could be improved. The reports will also explain aspects which caused difficulty and why the difficulties arose, whether through a lack of knowledge, poor examination technique, or any other identifiable and explainable reason.

A full copy of the question paper and the mark scheme can be downloaded from OCR.

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Paper 1 series overview

There were only a few candidates for this paper. There was a good spread of marks, although there were no very good scripts and several poor ones.

Three of the questions included the "detailed reasoning" instruction. In some cases, candidates did not include all the essential steps and so lost marks. An example is Question 6(a). Some candidates just found $x = 2$ and $x = -3$, possibly using the 'poly-solve' function on their calculator. They omitted to write proper inequality statements. If they arrived at the correct answer, they could score a maximum of 2 marks out of 4.

Two questions included the command word "Determine". This also implies the need to show full working. An example is Question 2(b). A correct answer following from muddled working, or with no working at all, was likely to score at most 1 mark. This is in contrast to Question 2(a) where the command word is "Find". In this part, a correct answer was likely to score full marks even if the working was muddled or inadequate.

In this paper, there is always at least one question requiring deduction from data, with a written response. In this case it was Question 9. There were some very good responses, however, some candidates seemed not to have read the question properly. For example, the question states that the data comes from the 15 LAs, other than those in London, with the largest decreases in the percentage driving to work. Some candidates seemed to think that the data came from a random sample, and in their answers they referred to the supposed need to consider other LAs.

Many candidates wrote far more than was necessary.

Candidates who did well on this paper generally did the following:	***Candidates who did less well on this paper generally did the following:***
• They had good algebraic skills. • They were able to express themselves clearly. • They had a good understanding of the logic of a hypothesis test.	• Many candidates had poor algebra skills. • Many had a poor grasp of vectors. • Many were unable to evaluate a definite integral correctly, even using the Integration function on the calculator. • Some were unable to work with a slightly complex probability situation.

Comments on questions

Question 2

Many candidates answered the first part correctly although, in some cases, the working was difficult to decipher. Some candidates did not appear to understand vectors, and in particular, addition and subtraction of vectors.

In part (b) many were confused about the gradients of perpendicular lines.

Question 3(a)

Most candidates made a good start by using $\tan\theta = \frac{\sin\theta}{\cos\theta}$. However, the majority of candidates did not see that it was then possible to divide both sides by $\sin^2\theta$. These candidates went on to use $\sin^2\theta + \cos^2\theta = 1$, and obtained a quartic equation in either $\sin\theta$ or $\cos\theta$. Although some candidates did this correctly, it took far longer, and gave greater opportunity for errors, than the more straightforward method.

Question 3(b)

There was a great deal of incorrect 'cancelling' by simply crossing out a pair of terms, one in the numerator and one in the denominator.

Question 4(b)

Almost no candidates realised the need to use $(1 + 0.002)^4$. Most tried to use $(1 + 1001)^4$.

Question 7

Many candidates answered this question well. However, others attempted to substitute from one equation into the other by simply setting the two left-hand-sides equal to each other. This did not achieve the desired result of obtaining an equation in one letter only.

Question 10

There were some very good responses to this question. However, it was clear that the candidates fell into two classes - those that had been trained to answer hypothesis test questions and those that had not been so well trained. A common error was to omit to define p in the hypotheses. Another, more serious, error was to find $P(X = 1)$ rather than $P(X \leq 1)$. A third common error was to give a definite conclusion such as "The proportion of packets containing a gift is less than 25%", rather than a correct, more limited, statement such as "There is significant evidence to suggest that the proportion of packets containing a gift is less than 25%".

Question 11(b)

Many candidates did not identify all four cases. Some only found the products of two, rather than three, probabilities.

Common misconceptions

?	**Misconception**	Many candidates engaged in incorrect 'cancelling', as mentioned in Question 3(b). Many candidates used '=' instead of '$\leq$' in the hypothesis test, as mentioned in Question 10.

Key teaching and learning points – comments on improving performance

The way to answer hypothesis test questions successfully can be taught as a simple list of steps to be learnt by rote. For more information, see the OCR Maths blog A Level Maths – hypothesis tests and the art of being non-assertive.

It is difficult to teach candidates how to answer questions requiring deduction from data. Perhaps the best strategy is to look carefully at all the past papers and practice papers, for both AS and A Level. In particular, a close study of the published mark schemes, and examiners' reports, will help teachers and candidates to understand what kinds of answers are acceptable.

Teachers should advise candidates carefully about the meanings of the command words given on pages 10 to 15 of the Specification, such as "Detailed reasoning", "Exact, "Determine", "State" and "Hence". These words are intended to be pointers as to how particular questions should be approached, so candidates need to be familiar with these before sitting the exam.

Guidance on using this paper as a mock

This paper covers the following topics: simple calculus, 2-dimensional; vectors, trigonometrical equations and identities, the binomial expansion of $(1 + x)^n$, sketching a cubic curve, solution of simple quadratic inequalities and equations, simple indices, simultaneous linear and quadratic equations, histograms, making deductions from a table of data, hypothesis testing for a binomial distribution, discrete probability distributions and addition and multiplication of probabilities.

In general, it tests algebraic skills of various kinds, and the understanding of relatively simple statistical ideas.

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